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# Taxonomic Revision of the Genus *Entada* (Leguminosae) in the Ryukyu Islands, Japan

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Two species of *Entada* are confirmed to occur in the Ryukyu Islands, Japan. One, *E. phaseoloides*, occurs in tropical to subtropical Asia, on Pacific islands and in northeastern Australia. The second species, *E. tonkinensis*, ranges from the Ryukyu Islands through northern Taiwan and southeastern China to northern Vietnam. Descriptions and keys are provided for the two species, as well as for *E. rheedii* and *E. parvifolia* which is sometimes confused with *E. phaseoloides*.

Keywords: *Entada phaseoloides*, *Entada tonkinensis*, leaflet number, Ryukyu Islands, seed morphology

*Entada* Adans. (Leguminosae; Mimosoideae) comprises about 30 species of lianas and scandent shrubs or subshrubs distributed in tropical and subtropical regions (Nielsen 1981, 1992, ILDIS 2005). Although more than half of the species occur only in Africa, three species have a very wide distribution; *Entada rheedii* Spreng. from Africa to the Indo-Pacific, *E. gigas* (L.) Fawc. & Rendle in the New World, and *E. phaseoloides* (L.) Merr. from Southeast Asia to the western Pacific region. These species have seeds that are dispersed by ocean currents, which likely explains their wide distribution. The northernmost limit of distribution of *Entada* is in the Ryukyu Islands at the southwestern tip of the Japanese archipelago.

The first report of *Entada* from the Ryukyu Islands was made by Ito & Matsumura (1899), who identified a specimen from Ishigaki Island, Yaeyama Islands as *E. scandens* Benth. Sakaguchi (1924) followed this treatment. Kanehira (1917), however, assigned these plants to his *Entada formosana* Kaneh., described from Taiwan, and treated plants from Yakushima and Amami-Oshima as the widespread *E. phaseoloides*. Makino & Nemoto (1925, 1931) (Table 1) adopted Kanehira's (1917) treatment. Later, Takamine (1952) recognized another species, *Entada koshunensis* Hayata & Kaneh., in the Yaeyama Islands. Sonohara *et al.* (1952) recognized *Entada formosana* from the Yaeyama Islands (Ishigaki, Iriomote and Yonaguni islands), and *E. koshunensis* from Ishigaki, Iriomote and Okinawa islands. Sonohara (1952), moreover, treated plants of *Entada* on Yakushima and Amami-Oshima Islands as *E. phaseoloides*. In addition to *Entada koshunensis*, Masamune (1955) recognized *E. phaseoloides* from Okinawa Island.

Hatusima (1956) treated *Entada koshunensis* as a synonym of *E. parvifolia* Merr. from the Philippines. His treatment (Hatusima 1956) was

followed by Hatusima & Amano (1958, 1967), who also recognized *Entada phaseoloides* on Okinawa Island. Hatusima (1971) later treated *Entada parvifolia* as a synonym of *E. phaseoloides*. Walker (1976) also considered *Entada phaseoloides* to be a widely distributed species with large morphological variation, and placed *E. koshunensis*, *E. parvifolia*, and *E. formosana* in its synonymy. Walker's (1976) treatment was adopted in many floristic works and checklists on the Ryukyu Islands (e.g., Hatusima & Amano 1977, 1994, Shimabuku 1990, 1997). Ohashi's (1989)

TABLE 1. Summary of taxonomic history of *Entada* in the Ryukyu Islands.

| References | Year | Yaeyama | Okinawa | Amami-Oshima | Yakushima |
|---|---|---|---|---|---|
| Ito & Matsumura | 1899 | *E. scandens* | | | |
| Kanehira | 1917 | *E. formosana* | | *E. phaseoloides* | |
| Sakaguchi | 1924 | *E. scandens* | | | |
| Makino & Nemoto | 1925 | *E. formosana* | | *E. phaseoloides* | |
| Makino & Nemoto | 1931 | *E. formosana* | | *E. phaseoloides* | |
| Takamine | 1952 | *E. formosana*<br>*E. koshunensis* | | | |
| Sonohara *et al.* | 1952 | *E. koshunensis*<br>*E. formosana* | | | |
| Sonohara | 1952 | *E. koshunensis*<br>*E. formosana* | | *E. phaseoloides* | |
| Masamune | 1955 | *E. formosana*<br>*E. koshunensis* | *E. phaseoloides* | | |
| Hatusima & Amano | 1958 | *E. parvifolia*<br>*E. phaseoloides* | | | |
| Hatusima & Amano | 1967 | *E. parvifolia*<br>*E. phaseoloides* | | | |
| Hatusima | 1971 | *E. phaseoloides* | | | |
| Walker | 1976 | *E. phaseoloides* | | | |
| Hatusima & Amano | 1977 | *E. phaseoloides* | | | |
| Ohashi | 1989 | *E. phaseoloides* | | | |
| Shimabuku | 1990 | *E. phaseoloides* | | | |
| Hatusima & Amano | 1994 | *E. phaseoloides* | | | |
| Ohashi | 2001 | *E. rheedii* | | *E. phaseoloides* | |
| Wakita *et al.* | 2005 | *E. koshunensis* | | *E. phaseoloides* | |
| Present study | | *E. phaseoloides* | | *E. tonkinensis* | |

treatment was fundamentally the same as Walker's (1976), but different in suggesting the possible occurrence of *E. parvifolia* on Ishigaki and Iriomote islands. Later, Ohashi (2001) recognized the plants from Yaeyama and Okinawa islands as *E. rheedii*.

In nearly all the treatments above, the species of *Entada* on Yakushima and Amami-Oshima (in the northern Ryukyu islands) has been treated as *E. phaseoloides*. In contrast, the plants of *Entada* on Okinawa and southward have either been considered to be *E. phaseoloides* or a different species. The history of the treatment of *Entada* in the Ryukyu Islands is summarized in Table 1.

Wakita *et al.* (2005) confirmed recently that two species of *Entada* occurred in the Ryukyu Islands. The first, recognized from Okinawa and Yaeyama islands, has small, convex seeds with angular margins (type S seed) and leaves with the second (distal) pinnae consisting of more than two pairs of leaflets. The second species, from Yakushima and Amami-Oshima islands, has large, compressed seeds with rounded margins (type L seed) and leaves with the second pinnae consisting of two pairs of leaflets. SSCP analysis revealed different DNA banding patterns in these species. The molecular difference is a nucleotide substitution and some insertion/deletion differences in the *rps16* intron of the chloroplast DNA. Tentatively, they assigned the plants from Okinawa and Yaeyama to *Entada koshunensis*, and plants from Yakushima and Amami-Oshima to *E. phaseoloides*. Definitive taxonomic decisions were not made because the sampling was limited only to the Ryukyu Islands and no phylogenetic analysis was conducted. Two species have recently been confirmed by phylogenetic analyses of samples from a wider distribution area using chloroplast DNA sequences (Wakita *et al.* 2008), although their taxonomy is still in question.

In this paper, we report the results of a taxonomic study on plants from the Ryukyu Islands, eastern and southeastern Asia, Oceania, and the Pacific islands. Our aim was to clarify the taxonomy of the two species and determine their geographic distribution.

## Material and Methods

Herbarium specimens preserved in BKF, BO, HN, HNU, HYO, IBSC, KAG, KYO, L, MAK, NH, NOU, NY, P, PDA, PNH, RYU, SING, TAI, TAIF, TI, TNS, TUS, URO, US, and W (see sweetgum.nybg.org/ih/ for the list of herbarium acronyms) were examined. Morphological characters, particularly of the leaf, pod, and seed, and geographical distributions were studied.

## Results and Discussion

In the survey of herbarium specimens, we tentatively distinguished *Entada phaseoloides* on the basis of the obliquely elliptic and distinctly asymmetric leaves (Fig. 1, Table 2). We then studied a large numbers of specimens of plants identified as *Entada phaseoloides* collected throughout its range of distribution (including the Ryukyu Islands) using seed shape as the primary key character (see Appendix for a list of specimens examined). The specimens examined were divided into two groups corresponding to the two species recognized in the study by Wakita *et al.* (2005). The geographical distributions of the two groups were then compared (Table 2).

We found that the plants with smaller, convex seeds with angular margins (type S seed) occur over a broad swath of tropical to subtropical Asia and the Pacific islands, while plants with large, compressed seeds with rounded margins (type L seed) occur in a smaller area from Vietnam to Japan (Fig. 2). The distribution of the former species coincides with that of *Entada phaseoloides* (Nielsen 1992). *Entada phaseoloides* was originally described as *Lens phaseoloides*

L. Merrill (1917) and Johnston (1949) chose as the type the plate of *Faba marina* by Rumphius in his Herbarium Amboinense 5: tab. 4 (1747). The plate had probably been drawn from a plant growing in Ambon, or an adjacent area (Scheffer 1871), which is within the range of distribution of plants with type S seeds. Based on Rumphius's *Faba marina*, Scheffer (1871) described *E. rumphii*, a name that has been treated as a synonym for *E. phaseoloides*. The two critically drawn plates attached to the original description of *Entada rumphii* show a convex seed with a lateral swelling (tab. 18 of Scheffer 1871), which can be regarded as a type S seed. From the above observations, we conclude that plants with type S seeds should be treated as *Entada phaseoloides*.

We also conclude that plants with type L seed should be assigned to *Entada tonkinensis* Gagnep. *Entada tonkinensis* was originally described from northern Vietnam (Gagnepain 1911), but has been treated as a synonym of *E. phaseoloides* (Nielsen 1980, 1981, Lock & Heald 1994), and has never been recorded outside Vietnam. According to the original description (Gagnepain 1911), the seeds of *E. tonkinensis* are 6 cm long, 5 cm wide, and compressed. These features are consistent with type L seeds. We also confirmed that the type specimen (*Balansa 2130*) of *Entada tonkinensis* at P is identical with specimens from the Ryukyus, Taiwan, and China. The monophyly of these samples has also been confirmed by phylogenetic analyses (Wakita *et al.* 2008). The redefined diagnostic characters of *Entada tonkinensis* and its distribution are given in the following key and taxonomic treatment (Table 2 and Fig. 1).

Wakita *et al.* (2005), assigned plants from the Ryukyu Islands with type L seeds to *Entada phaseoloides*, and plants with type S seeds to *E. koshunensis*. They followed the treatment of Ho (1985) for *Entada* in Taiwan, which was based on seed characters and leaflet numbers. In contrast with Wakita *et al.* (2005), we concluded that the plants with type S seeds are *Entada phaseoloides*, and those with type L seeds are *E. tonkinensis*. Although Wakita *et al.* (2005) recognized *Entada koshunensis*, we considered it to be a synonym of *E. phaseoloides*. In works recognizing *Entada koshunensis* as a separate species, the diagnostic character was given as the 3 or 4 pairs of leaflets (Hayata 1921, Makino & Nemoto 1925, 1931, Nemoto 1936 as *E. parvifolia*, Ho 1985, Huang & Ohashi 1993). Our herbarium study revealed that 3 or 4 pairs of leaflets appear predominantly in plants from the Philippines through southern Taiwan to the southern Ryukyu Islands, and sporadically over the entire area of distribution of *Entada phaseoloides* (see Appendix). Plants with 3 pairs of leaflets were also reported from the Solomon (Verdcourt 1979) and Bismarck islands (Nielsen 1992). Other features of *Entada koshunensis*, for example the distinctly asymmetrical leaflets (Fig 1b) and pods with rather thin parchment-like endocarps, are indistinguishable from *E. phaseoloides*.

Two other species, *Entada parvifolia* and *E. rheedii*, have sometimes been confused with *E. phaseoloides* in the Ryukyu Islands (Table 1). *Entada parvifolia* Merr., from the Philippines, has sometimes been applied to plants of *E. phaseoloides* from the southern Ryukyu Islands and southern Taiwan (Hatusima 1956, Hatusima & Amano 1958, 1967, Ho 1985, Huang & Ohashi 1993). The type specimen (*Ramos 5067*, NY. http://sciweb.nybg.org/science2/VirtualHerbarium.asp) and the original description of *Entada parvifolia* (Merrill 1908), however, show that it is difficult to confuse *E. parvifolia* with *E. phaseoloides*. As summarized in Table 2 and in the key, *Entada parvifolia* is not a gigantic liana, but rather a trailing or scandent shrub whose leaves have 8–11 pairs of small, almost symmetrical leaflets (Fig. 1), small pods 15–30 cm long, and 4–5.5 cm wide, a thin parchment-like endocarp, and small seeds 1.8–2 × 1.6–1.9 cm. *Entada parv-*

*ifolia* is placed in a different subsection, subsect. *Sphaerospermae* Brenan, from subsection *Entada* in which *E. phaseoloides* belongs (Brenan 1967, Nielsen 1992).

Early in the history of taxonomy on *Entada* in the Ryukyu Islands, the name *E. formosana*, a synonym of *E. rheedii*, was sometimes applied to plants on Yaeyama (Table 1). In the most recent comprehensive flora of Japan, Ohashi (2001) recognized *Entada rheedii* in the southern Ryukyu Islands and treated *E. phaseoloides* as its synonym. These two species, however, are clearly different in shape, size, and number of leaflets (Fig. 1), texture of the pod endocarp, and thickness of seeds (Table 2).

In this study, we show that two *Entada* species occurred in the Ryukyu Islands of Japan are *E. phaseoloides* and *E. tonkinensis*. In the recent

TABLE 2. Comparison of *Entada phaseoloides*, *E. tonkinensis*, *E. rheedii*, and *E. parvifolia*.

| **Character** | | ***E. phaseoloides*** | ***E. tonkinensis*** | ***E. rheedii*** | ***E. parvifolia*** |
|---|---|---|---|---|---|
| Habit | | giant woody climber | giant woody climber | giant woody climber | trailing or scandent shrub |
| Leaflet | outline | obliquely oblong to obliquely elliptic or obliquely obovately elliptic, distinctly asymmetrical | obliquely elliptic or obliquely obovately elliptic, distinctly asymmetrical | obovate to elliptic, or lanceolate, usually nearly symmetrical | oblong or obliquely oblong, nearly symmetrical |
| | apex | acute to obtuse | acute to rounded | obtuse to rounded | rounded, truncate or slightly emarginate |
| | no. per 2nd pinna | (1–)2–4 pairs | 2–3(–4) pairs | 4–5(–6) pairs | 8–11 pairs |
| | size of the distal ones on 2nd pinna | 7–11 cm long, 3.5–5.5 cm wide | 8.5–12 cm long, 4.4–6 cm wide | 6–9 cm long, 2.5–4 cm wide | 1.5–3 cm long, 0.6–1.1 cm wide |
| Pod | endocarp | parchment-like | parchment-like | woody | thinly parchment-like |
| | length | 50–120 cm long | 40–130 cm long | 40–120 cm long | 15–30 cm long |
| | width | 6–9.5 cm wide | 9–12 cm wide | 8–11 cm wide | 4–5.5 cm wide |
| | article | 4–7.5 cm long | 6–9.5 cm long | 5–8.5 cm long | 2.5–4 cm long |
| Seed | color | brown | blackish purple | brown | brown–dark brown |
| | shape | suborbicular, convex, margin angular | suborbicular, compressed, margin rounded | suborbicular, compressed, margin rounded | irregularly ovoid |
| | size | 3.5–5.5 × 3.3–4.5 cm | 5.2–7.4 × 4.7–5.5 cm | 3.5–5.7 × 3.5–5 cm | 1.8–2 × 1.6–1.9 cm |
| | thickness | 1–1.5 cm | 1.6–2.3 cm | 2–2.5 cm | 0.8–1.1 cm |
| Distribution | | Southeast Asia to the South Pacific | Vietnam, China, Taiwan, Japan | Africa, Indo-Pacific region, northern Australia | Philippines |

Red List of Japan only *Entada phaseoloides* is listed in the Ryukyu Islands (Kagoshima and Okinawa) as a category IB (EN) plant. Our study suggests the single species on the Red List includes two different taxa, *Entada phaseoloides* and *E. tonkinensis*, which should be considered separately for further conservation.

Key to the species in the Ryukyu Islands, including *Entada parvifolia* and *E. rheedii*

A1. Trailing or scandent shrubs; second (distal) pinna with 8–11 pairs of leaflets; distal leaflets of the second pinna 1.5–3 cm long, 0.6–1.1 cm wide; pods 15–30 cm long, 4–5.5 cm wide; seeds irregularly ovoid, 1.8–2 × 1.6–1.9 cm ..... *E. parvifolia* (known only from the Philippines)

A2. Large climbing vine; second (distal) pinna with less than 6 pairs of leaflets; distal leaflets of the second pinna more than 6 cm long, and more than 2.5 cm wide; pods more than 40 cm long, more than 6 cm wide; seeds compressed laterally, more than 3.5 × 3.5 cm ..... B

B1. Leaflets of second pinna 4 or 5(or 6) pairs; distal leaflets 6–9 cm long, 2.5–4 cm wide, usually nearly symmetrical (equal sided), apex obtuse to rounded; pods with hard woody endocarp, 8–11 cm wide; seeds more than 2 cm thick ..... *E. rheedii* (Africa, Indo-Pacific region, Australia)

B2. Leaflet of second pinna less than 4 pairs; distal leaflets more than 7 cm long, more than 3.5 cm wide, distinctly asymmetrical (unequal sided), apex acute to obtuse; pods with parchment-like endocarp ..... C

C1. Pods 6–9.5 cm wide; seeds 3.5–5.5 cm long, 3.3–4.5 cm wide, convex, 1–1.5 cm thick, brown, margin angular ..... 1. ***E. phaseoloides***

C2. Pods 9–12 cm wide; seeds 5.2–7.4 cm long, 4.7–5.5 cm wide, compressed, 1.6–2.3 cm thick, blackish purple, margin rounded ..... 2. ***E. tonkinensis***

## Taxonomic treatment

### 1. Entada phaseoloides (L.) Merr.

*Entada phaseoloides* (L.) Merr. in Philip. J. Sci. 9: 86 (1914); Merr., Interpret. Rumph. Herb. Amb. 253 (1917); Merr., Sp. Blancoanae 168, 194 (1918); Nemoto, Fl. Jap. Suppl. 379 (1936), p.p.; Brenan in Kew Bull. 1955 (2): 164 (1955); Masamune in Sci. Rep. Kanazawa Univ. 3(1): 120 (1955), p. min. p.; Hatusima & Amano, Fl. Okinawa: 45 (1958); Hatusima & Amano, Fl. Okinawa (2nd ed.): 49 (1967); Hatusima, Fl. Ryukyus: 345 & 844 (1971), p.p.; Hatusima, Fl. Ryukyus (rev. ed.): 345 & 844 (1975), p.p.; Walker, Fl. Okinawa: 541 (1976), p.p.; Hatusima & Amano, Fl. Ryukyus: 61 (1977), p.p.; Huang & Ohashi in Fl. Taiwan 3: 279 (1977), p. min. p.; I. Nielsen in Adansonia, ser. 2, 19(3a): 342 (1980); Ohashi in Satake *et al.*, Wild Flow. Jap. Woody Pl. 1: 233 (1989), p.p. incl. pl. 254: 1–2; Shimabuku, Vasc. Fl. Ryukyu Isls.: 217 (1990), p. p.; I. Nielsen in Fl. Malesiana, ser. I, 11(1): 179 (1992); Huang & Ohashi in Fl. Taiwan (2nd ed.) 3: 169, pl. 77 (1993); Hatusima & Amano, Fl. Ryukyus (2nd ed.): 88 (1994), p.p.; Shimabuku, Vasc. Fl. Ryukyu Isls. (rev. ed.): 250 (1997), p.p. –*Lens phaseoloides* L. in Stickman Herb. Amboin. 18 (1754); Amoen. Acad. 4: 128 (1759). —Lectotype: Rumphius, Herb. Amboin. 5: 5-8, tab. 4 (1747), (fide Johnston 1949).

*Mimosa scandens* L., Sp. Pl. ed. 2: 1501 (1763). – *E. scandens* (L.) Benth. in Hook., J. Bot. 4: 332 (1841); Ito & Matsumura in J. Sci. Coll. Imp. Univ. Tokyo, Sect. 1, 12: 442 (1899); Sakaguchi, Gen. Index Fl. Okinawa 54 (1924). —Lectotype: Rumphius, Herb. Amboin. 5: 5-8, tab. 4 (1747), (fide Johnston 1949).

*E. koshunensis* Kaneh. & Hayata in Hayata, Icon. Pl. Formosan. 10: 3, fig. 1 (1921); Makino & Nemoto, Fl. Jap.: 722 (1925); Makino & Nemoto, Fl. Jap. (rev. ed.): 568 (1931); Kaneh., Formos. Tree (ed. 2): 296 (1936); Sonohara *et al.*, Fl. Okinawa: 74 (1952); Sonohara, Useful Trees Shrubs Ryukyus: 32 (1952); Takamine, Fl. Yaeyama Gunto: 48 (1952); Masamune in Sci. Rep. Kanazawa Univ. 3(1): 120 (1955); Liu, Ill. Lign. Pl. Taiwan 1: 495 (1960). —Type: Taiwan, Pingtung Co.: Chiopeng, alt. ca. 50 m, Dec. 1919, *Kanehira 13205* (TAIF).

*E. formosana* auct. non Kaneh. & Hayata: Kaneh., Formos. Tree 195 (1917), p.p.; Makino & Nemoto,

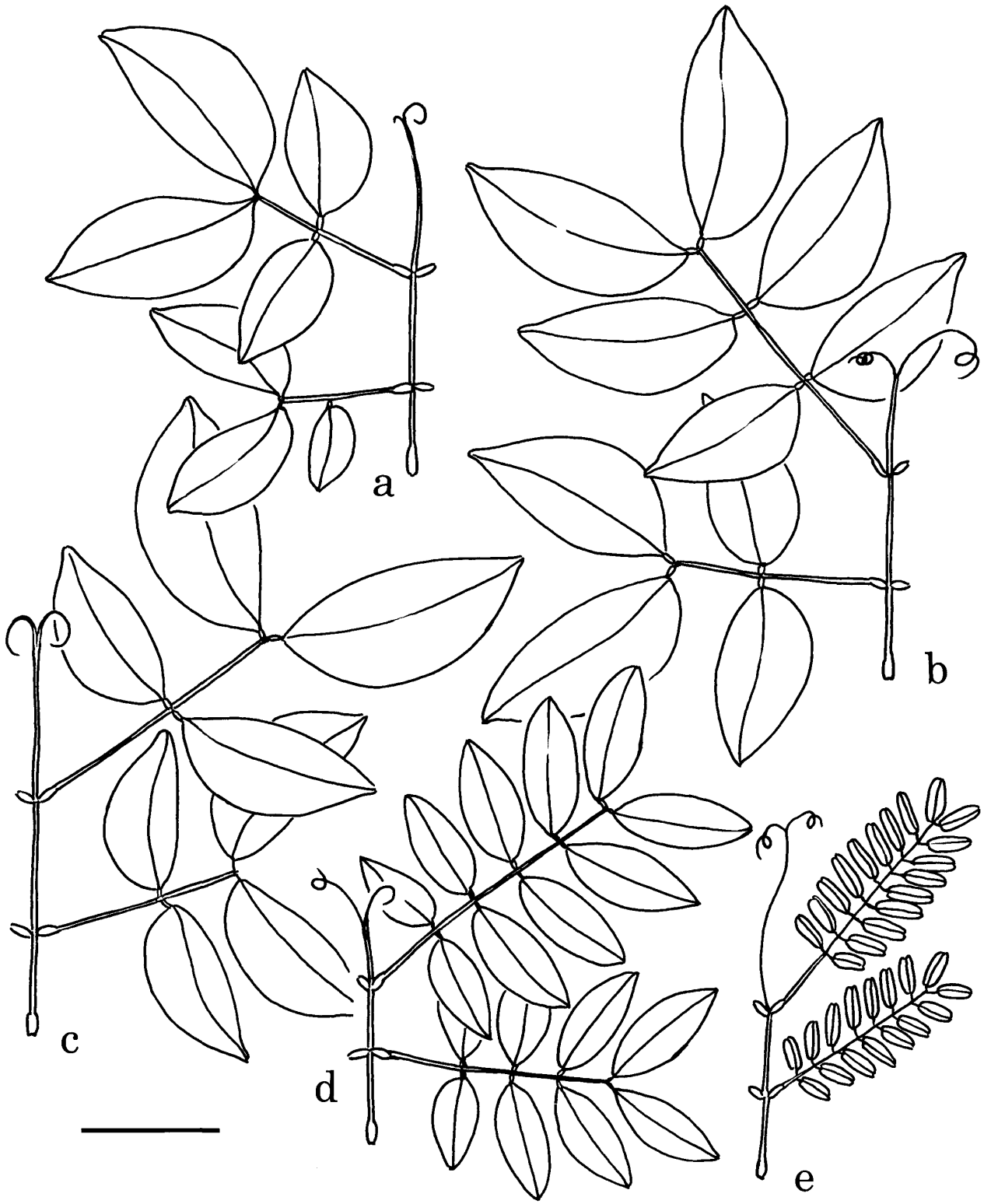


FIG. 1. Outline of leaves of *Entada*. a, b: *E. phaseoloides* (a: Papua New Guinea, *Carr 16315* (SING). b: Ishigaki Island, the Ryukyu Islands, *Nakamoto et al. 31* (URO). c: *E. tonkinensis* from Guangxi, China, *Akiyama et al. 1244* (TI). d: *E. rheedii from* Taiwan, *Tateishi & Hoshi 21620* (URO). e: *E. parvifolia* from Luzon, Philippines, *Ramos & Edano BS44583* (PNH). Scale bar: 5 cm.

Fl. Jap.: 722 (1925); Makino & Nemoto, Fl. Jap. (rev. ed.): 568 (1931); Nemoto, Fl. Jap. suppl.: 379 (1936); Sonohara *et al.*, Fl. Okinawa: 74 (1952); Sonohara, Useful Trees Shrubs Ryukyus: 33 (1952). Takamine, Fl. Yaeyama Gunto: 48 (1952); Masamune in Sci. Rep. Kanazawa Univ. 3(1): 3(1): 120 (1955).

*E. parvifolia* auct. non Merr.: Hatusima in Sci. Bull. Agric. Home Econ. Div. Univ. Ryukyus 3: 20 (1956); Hatusima & Amano, Fl. Okinawa: 46 (1958); Hatusima & Amano, Fl. Okinawa (2nd ed.): 49 (1967); Ho in J. Taiwan Museum 38(1): 76, photos 4 & 5, fig. 1C (1985); Huang & Ohashi in Fl. Taiwan (2nd ed.) 3: 169 (1993).

*E. rheedii* auct. non Spreng.: Liu *et al.*, Man. Taiwan Vasc. Pl.: 76 (2000), p.p.; Ohashi in Fl. Jap. 2b: 217 (2001).

Climbers, woody. Stems to 40 m long, often flattened and spiraling, base to 3 m in diam. Leaves alternate, petiolate, bipinnate; petiole 1.5–3.5 cm long including basal pulvinus, glabrous or puberulous; rachis, midrib and margins of leaflets glabrous or puberulous; rachis 2–5 cm long, ending in a bifid tendril; pinnae usually 2 pairs but 1 pair on juvenile plants, 6–20 cm long; leaflets (pinnules) opposite, (1 or)2 or 3 pairs on first (basal) pinna and (1 or)2–4 pairs (3 or 4 pairs on Ryukyu plants) on second (distal) pinna, increasing in size upward, rigidly chartaceous to coriaceous, adaxially shiny, drying considerably darker than abaxial surface), obliquely oblong to obliquely elliptic or obliquely obovate-elliptic, asymmetrical, base unequal-sided, apex acute to obtuse and more or less retuse, entire, 4–11 cm long, 2–5.5 cm wide (4–9.5 cm long, 2–4.5 cm wide in Ryukyu plants), distal pinnules second pinna 7–11 cm long, 3.5–5.5 cm wide (7–9.5 cm, and 3.5–4.5 cm wide in Ryukyu plants). Inflorescences spikes, solitary, in leaf axils or sometimes several spikes from short shoots, densely flowered, 12–30 cm long including peduncle; peduncle glabrous or puberulous, 1–6 cm long, 1.2–1.5 cm across; rachis rather densely puberulous. Bracts lanceolate, 0.6–1 mm long, abaxially puberulous, persistent. Flowers sessile or subsessile, pentamerous, distylous; flowers with short styles usually on lower half of spike, flowers with long styles on upper half of spike. Calyx green, broadly cup shaped, glabrous, 1.2–1.9 mm long; teeth inconspicuous, ciliate. Petals 5, valvate, green with reddish base, oblong or lanceolate, apex acute, 2.8–4 mm long, 1.1–1.8 mm wide. Stamens 10, filiform, 5.5–8.2 mm long, white, turning yellow after anther dehiscence; anthers 0.6–1.1 mm long, with a deciduous apical gland. Pistil stipitate; style 0.1–0.2 mm long in short styled flowers, ovary 0.7–1.1 mm long; ovules several, less than 0.1 mm long; style 2.7–4.8 mm long in long styled flowers, ovary 1.4–2.1 mm long, ovules 12–18, 0.1–0.2 mm long. Pods compressed, straight to slightly curved, sometimes slightly twisted, 0.4–1.2 m long, 6–10 cm wide, more or less constricted between seeds; exocarp falling at maturity, endocarp parchment-like, pale brown to pale grayish brown, splitting into 1-seeded, turgid segments; segments 6.5–7.5 cm long; sutures woody, thick, continuous, forming a hoop from which the enclosed segments readily detach at maturity. Seeds 9–16, reddish brown, suborbicular, compressed, convex, margin angular, 3.5–5.5 by 3.3–4.5 cm, 1–1.5 cm thick; hilum 0.5–3 mm long; with air filled cavity between cotyledons. Germination hypogeous; cotyledons remaining in seed coat; seedling leafless, first several nodes with only cataphylls.

*Japanese name*. Koshun-modama (Hime-modama).

*Distribution*. Japan (Ryukyu Islands), Taiwan (Pingtung Co.), Philippines, Malaysia (Sarawak), Indonesia, Papua New Guinea, Australia (E. coast of Queensland), Northern Mariana Islands, Palau, Micronesia (Yap, Truk, Pohnpei [Ponape] and Kusai Islands), Solomon Islands, Kiribati, Vanuatu, New Caledonia, Fiji, Tonga, Samoa and French Polynesia (Fig. 2).

Ryukyu Islands: Okinawa and Yaeyama islands (Ishigaki, Kohama, Iriomote and Yonaguni

islands). Forests bordering littoral swamps and mangrove and riverine vegetation. Flowering in June on Okinawa, April to August in Yaeyama Islands.

*Entada phaseoloides* is widely distributed in tropical and subtropical areas of Asia and the Pacific. Examination of many specimens of the genus from Asia and the Pacific shows that *E. phaseoloides* is not in southeastern continental Asia, but extends throughout the islands of the biogeographic province of Malesia, through the Pacific and along the eastern coast of Queensland (Fig. 2).

**2. Entada tonkinensis** Gagnep.

*Entada tonkinensis* Gagnep. in Lecomte, Not. Syst. 2: 60 (1911); Gagnep. in Fl. Indo-Chine 2(2): 65 (1913). —Type: Vietnam. Banton village, Tu-vu, in 1888, *Balansa 2130* (P, holo- and iso-).

*E. phaseoloides* auct. non (L.) Merr.: Kaneh., Formos. Tree: 193 (1917); Makino & Nemoto, Fl. Jap.: 723 (1925); Makino & Nemoto, Fl. Jap. (rev. ed.): 568 (1931); Masamune, Fl. Yakushima 241 (1934); Kaneh., Formos. Tree (rev. ed.): 296 (1936); Sonohara, Useful Trees Shrubs Ryukyus: 32 (1952); Ohwi, Fl. Jap.: 672 (1953); Masamune in Sci. Rep. Kanazawa Univ. 3(1): 120 (1955), p.p.; Hatusima & Amano, Fl. Okinawa: 46 (1958); Ohwi, Fl. Jap. (English ed.): 553 (1965); Hatusima & Amano, Fl. Okinawa (2nd. ed.): 49 (1967); Hatusima, Fl. Ryukyus: 345 (1971), p.p.; Kitamura & Murata, Colour. Ill. Wood. Pl. Jap. 1: 362, pl. 72-442 & fig. 236-2 (1971); Ohwi, Fl. Jap. (rev. ed.): 782 (1972); Ohwi, Fl. Jap. (new ed.): 782 (1975); Hatusima, Fl. Ryukyus (rev. ed.): 345 (1975), p.p.; Walker, Fl. Okinawa 541 (1976), p.p.; Hatusima & Amano, Fl. Ryukyus: 61 (1977), p.p.; Huang & Ohashi in Fl. Taiwan 3: 279, pl. 584 (1977), p.p.; Hatusima, Fl. Kagoshima: 69 (1978); I. Nielsen in Adansonia, ser. 2, 19(3): 342 (1980); I. Nielsen in Fl. Cambodge, Laos & Vietnam. 19: 21, pl. 3-1 (1981), p.p.; Ho in J. Taiwan Museum 38(1): 75, photo 8, fig. 1A (1985); Hatusima, Fl. Kagoshima (rev. ed.): 86 (1986); Wu in Fl. Reipubl. Popularis Sin. 39: 13 (1988), p.p., excl. pl. 5; Ohashi in Satake *et al.*, Wild Flow. Jap. Woody Pl. 1: 233, (1989), p. p., excl. pl. 254-1–2; Shimabuku, Vasc. Fl. Ryukyu Isls.: 217 (1990), p.p.; Hatusima, Fl. N. Ryukyus: 103 (1991); I. Nielsen in Fl. Males. Ser. I, 11(1): 179 (1992), p.p.; Huang & Ohashi in Fl. Taiwan (2nd ed.) 3: 169, pl. 77 (1993); Hatusima & Amano, Fl. Ryukyus (2nd ed.): 88 (1994), p.p.; Shimabuku, Vasc. Fl. Ryukyu Isls. (rev. ed.): 250 (1997), p.p.; Ohashi in Fl. Jap. 2b: 217 (2001).

*E. scandens* auct. non (L.) Benth.: Matsum. in Bot. Mag. Tokyo 16: 102 (1902), p.p.; Matsum. & Hayata in J. Coll. Sci. Imp. Univ. Tokyo, Sect. 1, 22: 116 (1906); Matsum., Index Pl. 2(2): 261 (1912); Tutcher in Rep. Bot. For. Dept. Hongk. 1914: 30 (1915).

*E. parvifolia* auct. non Merr.: Hatusima & Amano, Fl. Okinawa: 46 (1958), p.p.; Hatusima & Amano, Fl. Okinawa (2nd ed.): 49 (1967), p.p.

Climbers, woody. Stems often flattened and spiraling, base to 60 cm across. Leaves alternate, petiolate, bipinnate, glabrous; petiole 1.5–4 cm long including basal pulvinus; rachis 3–6.5 cm long, ending in a bifid tendril; pinnae usually 2 pairs, but 1 pair on juvenile plants, 10-22 cm long; leaflets (pinnules) opposite, 2 pairs on first (basal) pinna, 2 or 3 pairs on second (distal) pinna, increasing in size upward, rigidly chartaceous, adaxially shiny, sometimes drying considerably darker than abaxial surface, obliquely elliptic, or obliquely obovate-elliptic, asymmetrical, base unequal sided, apex acute to obtuse, entire, 5–12 cm long, 2.5–6 cm wide, distal pinnules on second pinna 8.5–12 cm long, 4.4–6 cm wide. Inflorescences spikes, solitary in leaf axils or several spikes from short shoots, densely flowered, 9–25 cm long including glabrous peduncle; rachis puberulous. Peduncle 1–7 cm long, 1.3–1.5 cm across. Bracts lanceolate, 0.6–1 mm long, abaxially puberulous, persistent. Flowers sessile or subsessile, ca. 6 mm long, pentamerous, distylous; short styled flowers usually on lower half of spike; long styled flowers on upper half of spike. Calyx green, broadly cup shaped, glabrous, 1.2–2 mm long; teeth inconspicuous. Petals 5, valvate,

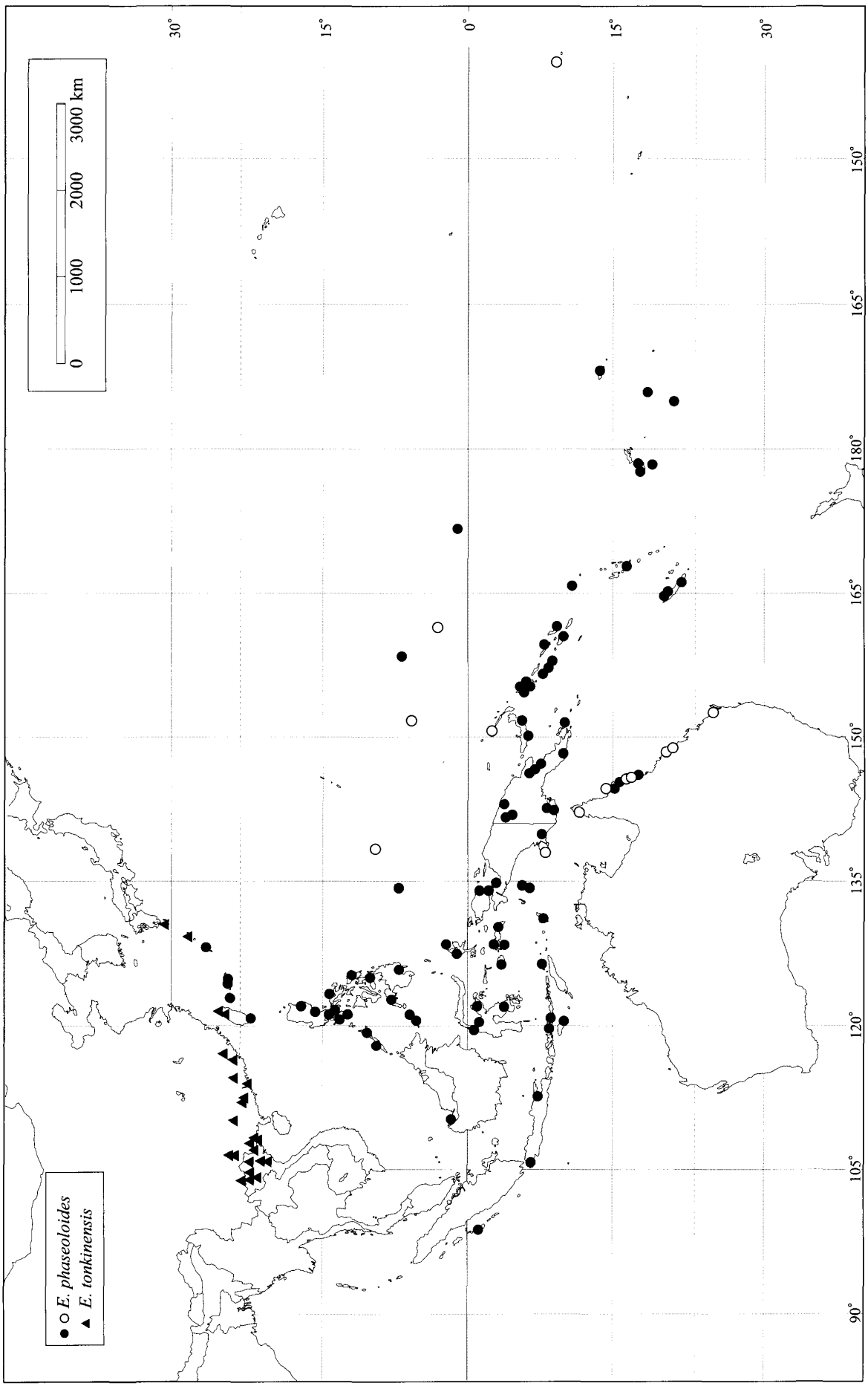


FIG. 2. Distribution map of *Entada phaseoloides* ( ● from herbarium specimens; ○ from literature) and *E. tonkinensis* ( ▲ ).

pale green with reddish base, elliptic to oblong, apex acute, 3–3.2 mm long, 1.3–1.5 mm wide. Stamens 10, filiform, 5.5–7 mm long, white, turning yellow after anther dehiscence; anthers 0.5–1 mm long, apically with a deciduous gland. Pistil stipitate; style of short styled flowers 0.1–0.6 mm long, ovary 0.5–1 mm long; ovules several, less than 0.1 mm long; style of long styled flowers 4–4.7 mm long, ovary 1.8–2 mm; ovules 12–18, 0.1–0.2 mm long. Pods compressed, straight to slightly curved, 0.5–1.5 m long, 9–12 cm wide, exocarp falling at maturity; endocarp parchment-like, pale brown, splitting into 1-seeded, turgid segments 6.5–7.5 cm long; sutures woody, thick, continuous and forming a hoop from which enclosed segments readily detach at maturity. Seeds 9-16, blackish purple, compressed, suborbicular, margin rounded, 5.2–7.4 by 4.7–5.5 cm, 1.6–2.3 cm thick. Germination hypogeous, cotyledons remaining within seed coat; seedling leafless, first several nodes with only cataphylls.

*Japanese name*. Modama.

*Distribution*. Japan (Ryukyu Islands), Taiwan (northern and central counties), China (Hong Kong, Fujian, Guangdong, Guangxi, Yunnan), North Vietnam (Fig.2).

Ryukyu Islands: Yakushima and Amami-Oshima. Riverine vegetation. Flowering in June.

In the Ryukyu Islands, *Entada tonkinensis* has always been treated as *E. phaseoloides* (Table 1), but can be clearly distinguished by seed shape and size (Table 2). The type specimen (Balansa 2130) of *E. tonkinensis* at P has leaves with two pairs of obliquely elliptic and distinctly asymmetrical leaflets, but has no seeds. According to the original description (Gagnepain 1911), the seeds of *E. tonkinensis* are compressed, but not at all convex.

*Entada tonkinensis* ranges from the northern Ryukyu Islands through northern and central Taiwan and southeastern China to northern Vietnam. Entada tonkinensis grows in inland evergreen forests, especially along streams at low and medium elevations.

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APPENDIX. Specimens examined. Number following herbarium acronym shows number of largest pair of leaflets on second pinnae; letters indicate seed type (S: type S; L: type L).

***Entada phaseoloides*** (L.) Merr.

JAPAN. **Ryukyu Islands**. No precise locality: Aug. 1909, *Miyagi s.n.* (MAK)3; fr, *Hatusima s.n.* (RYU). —Okinawa I.: Kunigami, 27 Jan. 1924, *Tashiro s.n.* (KYO, TAIF)4; Kunigami-son, Ibu, Ibu river, 5 Apr. 1974, fl.bud, *Shinzato s.n.* (RYU)3; *ibid.*, May 1984, fr, *Murata s.n.* (URO); *ibid.*, 11 Nov. 1984, fr.s, *Murata 17088* (TI, TUS, URO) 3/S; *ibid.*, 25 Apr. 1995, *Tateishi et al. 40529* (URO)4; *ibid.*, 29 Apr. 1995, fr, *Nakamoto 8* (URO); *ibid.*, 27 May 1995, fl, *Nakamoto & Nakamoto 25* (URO)4; *ibid.*, 28 May 1995, fl, *Kanna 1* (URO); *ibid.*, 27 Jun. 1995, fl, *Nakamoto & Ogawa 2* (URO)3; *ibid.*, 27 Jun. 1995, fl, *Nakamoto 7* (URO)4; *ibid.*, Sep. 1995, fr, *Yamashiro s.n.* (URO); *ibid.*, alt. 60–80 m, 30 Nov. 1995, *Nakamoto 26* (URO)4; *ibid.*, 26 Dec. 1995, *Kurima et al. 126* (URO); *ibid.*, 5 Feb. 1997, *Kurima & Tateishi 242* (URO)3-4/L; *ibid.*, 3 Jun. 1997, *Kurima & Matsumura 117* (URO)3-4; *ibid.*, 6 Jun. 1998, *Kurima & Matsumura 118* (URO)3; *ibid.*, 26 May 2001, *Wakita 210526-1* (TI, URO)3-4/S; Onna-dake, 27 Feb. 1935, *Tawada 348* (KYO)4. —Ishigaki I.: No precise locality, fr.s, *Kuroiwa s.n.* (TI)S; *ibid.*, 11 Aug. 1894, fl, *Ito 1280* (TI), 25–31 Jul. 1923, fl, *Koidzumi s.n.* (KYO)3, in 1923, *Sakaguchi s.n.* (KYO)3; Suriyama, 19 Mar. 1895, fl, *Ito 1394* (TI); Yuriyama, 6 Aug. 1919, *Kawagoe s.n.* (KAG); Ota, 11 Nov. 2002, *Wakita & Tateishi 231111* (URO)3; Upper stream of Miyara river, above Maesato reservoir, 2 Mar. 1995, fr, *Murata s.n.* (URO)S, 18 Mar. 1995, fr.s, *Tateishi et al. 40542* (URO)3/S; Maesato reservoir, alt. 40–50 m, 4 Jan. 1996, *Nakamoto et al. 29* (URO)3; *ibid.*, 8 Jul. 1997, fl, *Kurima & Matsumura 116* (URO)3; *ibid.*, 30 Jul. 1997, fl, *Kurima & Matsumura 105* (TI, URO)3; Mt. Fukai-omoto, 3–6 Jul. 1974, *Miyagi et al. 37811* (RYU)3; Omoto, 8 Dec. 1996, *Kurima & Matsumura 234* (URO)3; Sokohara, 14 Jun. 2002, *Wakita 210614* (TI, URO)3; *ibid.*, 16 Jul. 2003, *Wakita & Tateishi 230716* (URO)3; upper stream of Nagura river, 7 Dec. 1996, *Kurima & Matsumura 233* (URO)3; *ibid.*, 2 Aug. 1997, fl, *Kurima & Matsumura 108*, (TI, URO)3; *ibid.*, 3 Aug.1998, *Kurima & Matsumura 101* (URO)3; Nagura, 28 Jul. 1973, fl, *Furuse 3671* (RYU, TUS)3; Nagura, 22 Jul. 2001, *Wakita & Matsumura 210722b* (URO)3; upper stream of Miyara river, 2 Aug. 1923, fl, *Tawada 347* (KYO)3; east of Takada, upper stream of Miyara river, 23 Feb. 1988, seedl & fr, *Murata & Murata 15580* (TI)3; Motonagura, 22 Jul. 2001, *Wakita & Matsumura 210722C* (URO)3; Kawahara, alt. ca. 20 m, 16 Sep. 1994, fr, *Tateishi et al. 40278* (URO)4, & *40281* (URO)S; *ibid.*, 14 Jan. 1996, *Nakamoto et al. 30* (URO)3-4; *ibid.*, 8 Jul. 1997, fl, *Kurima & Matsumura 112* (URO)4; Bannadake, 30 Jul. 1959, *Oka 13172 & 13184* (KAG), 27 Mar. 1974, fr, *Furuse 5441* (RYU); *ibid.*, 18 Mar. 1995, *Tateishi et al. 40543* (URO)3; *ibid.*, 4 Jan. 1996, *Nakamoto et al. 31* (URO)3; *ibid.*, 7 Dec. 1996, *Kurima & Matsumura 235* (URO)3; *ibid.*, 8 Jul. 1997, fl, *Kurima & Matsumura 111* (URO)3; *ibid.*, 30 Jul. 1997, fl, *Kurima & Matsumura 104* (TI, URO)3; Arakawa, seaside, 8 Aug. 1973, fr, *Kawakami s.n.* (RYU)S; Kabira–Yoshihara, 21 Aug. 1961, fl, *Migo 25830* (RYU)3; Uganzaki 30 Jul. 1997, fl, *Kurima & Matsumura 113* (TI, URO)3; *ibid.*, 3 Aug. 1997, fl, *Kurima & Matsumura 107*, (TI, URO)3-4; *ibid.*, 22 Jul. 2001, *Wakita & Matsumura 210722* (URO). —Kohama I.: E. part, sandy beach, 4 Mar. 1997, *Yamashiro 3034* (URO)3; *ibid.*, 26 Mar. 1998, *Shinjo & Tateishi 10950* (URO)3; *ibid.*, 13 Jun. 2002, *Wakita 220613* (URO)3. —Iriomote I.: No precise locality, 1–20 Jul. 1923, fl, *Koidzumi s.n.* (KYO)3, 28 Aug. 1966, fl, *Miyagi 3645* (RYU)3, 17 Aug. 1967, *Miyagi 3696* (RYU)3, Apr. 1973, yfr, *Wada s.n.* (TI); Funaura, around the Tropical Biological Research Center, Ryukyu Univ., 123°48′00–10″E, 24°23′30″N, alt. 30–40 m, 16 Apr. 1998, fl, *Yonekura et al. 98073* (TUS)3; Haemi-dake, May 1937, fl, *Sonohara s.n.* (KYO, TI)3; Kuira-gawa River, 123°50′47.5″E, 24°23′54.5″N, alt. 20 m, 21 Jul. 2003, fl, *Kokubugata 1571* (TNS)2; Nakama river, 11 Aug. 1969, fr, *Tokeshi 33* (RYU)3, 16 Jun. 1971, s, *Yamazaki s.n.* (TI)S, alt.0–30 m, in mangrove swamp, 29 Apr. 1982, fr, *Fukuoka 11349* (KYO)3; mouth of the Yutsun river, alt. 10 m, 5 Jan. 1996, *Nakamoto et al. 32* (URO)3; Yutsun river, 4 Dec. 1996, *Kurima & Matsumura 124* (URO)S; *ibid.*, 21 Jul. 2001, *Wakita 210721*, (URO); Yoshikera, 14 Aug. 1998, *Kurima & Matsumura 128* (URO)3-4; Kura, 14 Aug. 1998, *Kurima & Matsumura 141* (URO)3; Inda-zaki, 12 Jun. 2002, *Wakita 210612* (URO)3. —Yonaguni I.: 11–13 Jul. 1923, *Koidzumi s.n.* (KYO)4; 4–13 Jul. 1967, *Shinjo 5313* (URO); Urabu, 24 Jan. 1993, *Miyara s.n.* (URO)4; Higawa, alt. 70 m, 6 Jan. 1996, fr.s, *Nakamoto et al. 33* (URO)3/S; *ibid.*, 10 Jun. 2002, *Wakita 210610* (TI, URO)3; *ibid.*, 9 Nov. 2002, *Wakita & Tateishi 231109* (URO)S.

TAIWAN. Pingtung Co.: Koshifo, Aug. 1981, *Hsu s.n.* (TUS)S; Chiopeng, alt. ca. 50 m, Dec. 1918, fr.s, *Kanehira 13205* (TAIF, holotype of *E. koshunensis*)S; *ibid.*, alt. ca. 50 m, 1 Sep. 1984, *Tateishi et al. 18446*

(TAI, TUS)3; Chiopeng, Chiopeng river, 22°06′29.9″N, 120°52′55.5″E, alt. 30–50 m, 22 Sep. 2003, *Wakita 240922-1*(URO)3/S, *ibid.*, 22°06′32.0″N, 120°52′51.9″E, alt. 30–50 m, 22 Sep. 2003, *Wakita 240922-2* (URO)3/S, *ibid.*, 22°06′44.1″N, 120°52′46.2″E, alt. 30–50 m, 22 Sep. 2003, *Wakita 240922-3* (URO)4/S; Nanjen-shan, 22°05′ 68.7″N, 120°53′47.7″E, alt. 20–50 m, 23 Sep. 2003, *Wakita 240923* (URO)3-4; Nanjen-shan–Chiopeng, alt. ca. 200 m, 2 Nov. 1982, *Ohashi et al. 14406* (TUS), *14410* (TUS, URO)3, fr, *14449* (TUS) & fr,*14557* (TAI, TUS)3.

PHILIPPINES. Luzon I.: Rizal Prov., Mar. 1905, *Ahern's collector FB2901*, fl (BO, P, SING)3; Tayabas Prov., Casiguran, May-Jun. 1925, yfr, *Ramos & Edano BS45227* (IBSC, SING)3; Quezon Prov., Ilavac, alt. 1025 ft, *14* Jul. 1961, *Lagrimas & Rojo SH-323* (PNH)3; Sorsogon Prov., Irosin, Mt. Bulusan, Nov. 1915, fr, *Elmer 15305* (KAG, P, W)3, Jul. 1916, fl, *Elmer 14723* (KAG, W)3; Isabella Prov., San Mariano, Feb.–Mar. 1926, *Ramos & Edano BS47055* (IBSC, P)3; Camarines Prov., Albay, Jun. 1908, fl, *Curran FB12256* (P)3. —Polillo I.: Karlagan, alt. 30 m, 19 Nov. 1948, yfr, *Fox 21* (PNH)3. —Mindoro I.: Apr.–May 1908, *Merritt FB41423* (L)3. —Samar I.: Mt. Sohoton Natural Bridge National Park, Basey, 31 Jan. 1992, fr.s, *Barbon et al. PPI-5782* (PNH)3/S. Leyte I.: Hubasan, VISCA, Baybay, alt. 731 m, 1 Mar. 1993, yfr, *Gaerlan et al. PPI-10648* (PNH)3. —Palawan I.: Quezon, Ampaplot, 1 Oct. 1964, fr.s, *Espiritu PNH 91467* (PNH)2. —Mindanao I.: Davao Distr., Todaya, Mt. Apo, Aug. 1909, *Elmer* (BO); Zamboanga del Norte, Dilsus, 31 Jan. 1958, fl, *Frake 710* (PNH)3; ibid., alt. 500 m, 12 Feb. 1958, fl, *Frake 773* (PNH); Bukidnon Prov., Mt. Katanglad, alt. 1700 m, 11 Apr. 1949, fl, *Sulit 3458* (PNH)3. —Sulu Prov., Tawitawi I.: Jul.–Aug. 1924, fl, *Ramos & Edano BS44221* (BO, P, SING)2-3.

PALAU. Kayangel I.: 28 Aug. 1939, drifted seed, *Tuyama s.n.* (TI)S. —Palau I.: Airai, inner edge of mangrove area, alt. 10 m, 4 Nov. 1969, fl, *Fischer 4* (L)2. —Korror I.: Armijt, 10 Aug. 1939, fl, *Tuyama s.n.* (TI)2; Arumizu, 10 Aug. 1939, fr, *Tuyama s.n.* (TI)S; Campus of Tropical Biology Institute, 13 Sep. 1939, *Tuyama s.n.* (TI)2.

NORTHERN MARIANA ISLANDS. Saipan: Angaur I., seedl, *Tuyama s.n.* (TI).

MICRONESIA. Pohnpei (Ponape): Jul.–Aug. 1929, *Kanehira 750* (TI)2.

MALAYSIA. Sarawak: Kuching Div., Bako National Park, Dec. 1956, *Murthy S.7678* (SING)2, 17 Jul. 1966, fl, *Hou 533* (L)2; ibid., Telok Asam, 31 May 1963, fl, *Ashton S.17814* (L, SING)2-3; *ibid.* 8 Aug. 1979, fl, *Chai S.41005* (L)2; *ibid.* 29 Mar. 1975, fl, *Paie S.36418* (L)2.

INDONESIA. **Sumatra**. 14 Nov. 1920, *Lorzing 7871* (BO). —Mentawai Is.: Siberoet I., 11 Sep. 1924, yfr, *Iboet 65* (BO, L, SING), 9 Sep. 1924, yfr, *Boden-Kloss 10597* (BO, SING). —Krakatau I.: 20 Jul. 1924, *van Leeuwen 7985* (BO)3. **Java**. 24 Nov. 1914, yfr, *Backer 17467* (BO). —Jawa Barat: Kediri, Prigi, 22 Feb. 1914, fr, *Backer 11773* (BO, L)2/S; Banten Prov., Udjung Kulon Nature Reserve, 27 Jan. 1984, yfr, *Wirawan s.n.* (L)2. **Sulawesi**. Sulawesi Tengah: east slope of Benteng bay, Togean, 0°21′S, 122°00′E, alt. 50 m, 21 Dec. 1999, fl, *Sidiyasa 1839* (BO, L)2; Sopu valley, c. 80 km SSE of Palu, c. 1°16′S, 120°18′E, alt. 1000 m, 26 May 1979, fl, *van Balgooy et al. 5556* (BO, KYO, L)3; Kampong Kadolo, in 1913, fl, *Rachmat 729* (BO, L)2; Wuasa, Lowe Utara I. 1°25′18.3″S, 120°18′48.8″E, alt. 1100 m, 28 Mar. 2001, fl, *Kessler et al. PK3096* (L)2. —Sulawesi Tenggara: Kendari, G.Atolanu, Sampara, Kab.Unaha, alt. 80 m, 6 Feb. 1986, fr, *Amir 64* (BO)2/S. **Nusa Tenggara Timur**. Lesser Sunda Is. Flores I.: 28 Jun. 1974, yfr, *Verheijen 4317* (L)3; Manggarai, alt. 700 m, 16 Apr. 1936, fl, *de Voogd 2838* (BO, L)2; S. part, Mt. Ndebi, alt. 500 m, 14 Apr. 1965, *Kostermans & Wirawan 230* (L)2. —Sumba I.: Maumaru–Kenanggar, alt. 750 m, 25 Jan. 1975, yfr, *Wiriadinata 479* (BO)2. **Maluku** (Moluccas). Halmahera I.: fl, *de Vriese s.n.* (L)2; Galela, alt. ± 20 m, 20 Sep. 1921, fr, *Beguin 1739* (BO, L)2/S. —Ternate I.: Toramadiahi, alt. ± 400 m, 20 Dec. 1920, fl, *Beguin 1241* (L)2, & *1242* (BO)2. —Tanimbar Is.: Yamdena I.: 12 Mar. 1938, yfr, *Buwalda 4127* (BO, L)2, near Ranarmoje River, near Norkese, 5 Apr. 1956, fl, *van Borssum 3284* (BO, L)2; Selaru I., 13 Mar. 1956, yfr, *Pleyte 77* (BO). —Boeroe I., Kajeli, *Teysmann 1871* (BO); Wa'Katin, alt. 600 m, 21 Apr. 1921, *Toxopeus 158* (BO). —Ceram I.: 19 Nov. 1993, fr, *Suharno IRA61* (BO)2/S; Sungei Mala, Uweth, Taniwel, alt. 10 m , 15 Dec. 1984, fl, *Ramlanto 491* (BO, L)2-3; Desa Gah, Kec. Seram Timur, alt. 3 m, 17 Feb. 1986, *Mirmanto & Ruskandi ERI.101* (BO)2. —Ambon I.: *Teysmann s.n.* (BO), *de Vriese & Teysmann s.n.* (L)2, Tochehoc, 11 Jul. 1900, *Boerlage 202* (BO)2; Benteng, 24 Oct. 1931, s, *Rant 528* (BO)S. —Wetar I. Masapun: S. coast, alt. 2 m, 13 Apr. 1939, fl, *Bloembergen 3713* (PNH, SING)2-3. —Aru Islands: 19 Apr. 1993, *Nooteboom 5688* (L)2; Trangan I., W. of Sia, 6°49′S, 114°16′E , 5 Oct. 1994, fl, *van Balgooy 6649* (L)3. **Papua** (Irian Jaya). Andai, south of Manokwari, 31 Mar. 1943, fl, *Tuyama 997* (TI)2; Merauke Distr., Agats, Kec. Sawaerma, Ds. Sawa, alt. 10 m, 23

Oct. 1992, fl, *Widjaja et al. EW6219* (L)2; Vogelkop, Manokuwari subdistr. Warnapi, 15 km north of Ransiki, alt. ± 20 m, 27 Sep. 1948, *Kostermans 2804* (BO, L, SING)2; W. New Guinea, Servei, 26 Sep. 1939, yfr, *van Dijk 998a* (BO, L)2; Mamberamo region, Idenburg River, alt. 125 m, 1 Sep. 1914, fl, *Feuilletau de Bruyn 79* (BO)2; Wandarmon Pen., Wondiwoi Moutains, alt. 800 m, 28 Feb. 1962, fl, *Schran 13311* (KYO, L)3; Div. South N. Guinea, along river Maro, between Merauke and Tajam, 12 Jul. 1957, fr.s, *Kalkman BW3732* (BO, L)2/S; South New Guinea, Sg. Aoendoena near Oeta, alt. 3 m, 9 Jul. 1941, fl, *Aet 492* (BO, L)2; Kp. Tajam, 29 Jul. 1941, fl, *Anta 204* (L)2.

PAPUA NEW GUINEA. Northern Div., ca. 1/2 km inland of Cape Killerton, 9 Jul. 1953, yfr, *Hoogland 3260* (L)2. East Sepik Prov., Hunstcin range (Mt. Sansan), 4°28′S, 142°43′E, alt. 100–200 m, 5 Aug. 1990, fl, *Takeuchi 6458* (L)4. —Sepik Distr.: Aitape Subdistr., near Wantipi village, along Bliri River, alt. ca. 650 ft, 29 Jul. 1961, fl, *Darbyshire & Hoogland 8315L* (PNH, SING)4. —Eastern Papua, 500 ft, Jan. 1941, s, *Shaw Mayer s.n.* (SING)S. —Lower Fly River, E. bank opp. Sturt I., Oct. 1936, fl, *Brass 8082* (BO, L)2. —Western Distr.: Kiunga Subdistr., Base Camp, Ok Tedi River, 5°14′S, 141°12′E, alt. 2500 ft, 2 Nov. 1969, fl & yfr, *Foreman & Galore NGF 45772* (L)2; Oriomo Creek, south of Yakup Cr., 8°50′S, 143°00′E, alt. 50 ft, 26 Sep. 1963, *Womersley NGF 17763* (L)2; Oriomo River, 8°50′S, 143°15′E, alt. 70 ft, Jan. 1959, *White & Gray NGF 10444* (L)2. —Morobe Distr. Bupu River, 6°45′S, 147°00′E, alt. c. 100 ft, 29 Sep. 1960, fl, *Henty NGF 13620* (L, SING)2, *ibid.*, 5 Sep. 1963, fl, *Henty NGF 16699* (L)2; N. coast of Huon Gulf at Singaua Plantation, 147°09′E, 06°40′S, 30 Oct. 1962, fl, *Hartley 10866* (L)2; Lae Subdistr., Singawa, 20 miles from Lae, 6 45′S, 147 00′E, alt. 10 m, 4 Apr. 1974, fr, *Katik NGF 37993* (L)2; Lae Subdistr., Apo beach, 6°44′S, 147°00′E, alt. sea level, 29 Sep. 1978, fl, *Kerenga et al. LAE 74302* (L)2; Labu, 6°45′S, 146°55′E, alt. 10 ft, 13 Dec. 1965, fl, *Streimann & Kairo NGF 26084* (L)2. —New Britain: Kandrian Subdistr., Piriloma Village, 6°06′S, 150°45′E, alt. c. 1300 ft , 11 Mar. 1965, fl & fr, *Sayers NGF 21913* (L)3; E. New Britain Distr., Pomio Subdistr., 5°04′S, 151°48′E, alt. 900 m, 9 Jun. 1973, fl, *Stevens & Lelean LAE 58669* (L, PNH)2. —Sudest Island: Jac Landing, 16 Aug. 1956, fl & yfr, *Brass 27715* (L)2. —Kokoda, ca. 1200 ft, 30 Mar. 1936, fl, *Carr 16315* (SING)2, ca. 2000 ft, 28 Apr. 1936, fl, *Carr 16474* (PNH, SING)2. —Bougainville I.: Karngu, Buin, sea level, 17 Oct. 1930, fr.s, *Kajewski 2265* (BO)2; Lower south slope of Lake Loloru Water, c. 14 miles north of Buin, alt. c. 2300 ft, 13 Aug. 1964, fl, *Craven & Schodde 259* (PNH)2; Siwai, Dec. 1932, fl, *Waterhouse 821-B* (L); Maisua, 18 Sep. 1931, *Waterhouse 548-B* (L).

SOLOMON ISLANDS. Shortland Is.: South East Oema I., 2 Apr. 1969, fl, *Mauriasi et al. BSIP 13807* (SING)2. —New Georgia Is.: Bambari area, east Kolombangara I., ridge top 240′ above sea level, 3 Jan. 1968, fl, *Mauriasi et al. BSIP 8583* (L, SING)3; Vangunu I., Gevala River, 12 Dec. 1962, fl, *Whitmore BSIP 1246* (L); Vangunu I., Balavaeni, 10′ above sea level, 19 Jul. 1965, fl, *Maenu'u BSIP 6123* (L, SING)3; S.E. New Georgia, Mango River, 10′ above sea level, 22 Jun. 1965, fl, *Maenu'u BSIP 6056* (SING)2; Totepari I., east of Maoesango Pt., ridge top 650′ above sea level, 23 Jul. 1969, fl, *Mauriasi et al. BSIP 16121* (L)2. —Santa Ysabel I.: Allardyce Harbour, alt. 50 ft, behind the mangrove, 16 Oct. 1963, fl, *Whitmore BSIP 2210* (L)2. N.W. Santa Cruz, Graciosa Bay (Kauri Area), ridge top 400′ above sea level, 11 Nov. 1969, fl, *Mauriasi et al. BSIP 17209* (L, SING)3. —Malaita I.: S.W. Malaita, Are Are Distr., west coast, Kiu, 13 Dec. 1963, fr, *Whitmore BSIP 3876* (L, SING)3. —N.E. Guadalcanal I.: Rere River, c. 3 miles inland, 24 Nov. 1963, fr, *Whitmore BSIP 2780* (L, SING)3.

AUSTRALIA. Queensland. Near Noah Head. Daintree National Park, 16°07′25.9″S, 145°27′25.0″E, alt. ca. 100 m, 13 Dec. 2004, fr.s, *Kajita & Takayama 04121301* (TI)2; Kulki area, Cape Tribulation, Daintree National Park, on sandy beach. 16°04′S, 145°30′E, alt. 0 m, 13 Dec. 2004, fr.s, *Kajita & Takayama 04121302* (TI)2 & *04121303* (TI)2/S; Cook Distr., Mission Beach, near Clump Point jetty, 17°05′S, 146°00′E, alt. 10 m, 25 Aug. 1978, fl, *Thorsborne et al. 467* (L)2; Cow Bay, 16°08′35.4″S, 145°27′14.2″E, 15 Nov. 2000, *Tateishi & Omine 53108* (TI, URO)4.

KIRIBATI. Phoenix Islands. Kanton I.: Jetsam, Feb. 1958, drifted seeds, *Degener & Degener 24628* (TI)S.

VANUATU. Malekula I.: Malekula mainland, opposite Awei I., Maskelynes, alt. 5 m, 16 Nov. 1992, fl, *Curry 910* (L)2. —Efate I.:Mt. Bernier, fr, *Konishi 1299* (TNS)1-2/S.

NEW CALEDONIA. Auf den Bergen bei Oubatche, alt. 1000 m, 13 Dec. 1902, fl, *Schlechter 15398* (L, W)2; Hienghene, 26 Jun. 1971, fl, *McKee 23920* (NOU); Cours moyen et inferieur de la Tchamba, 17 Aug. 1966, fr, *Nothis 242* (NOU); Basse Valee de la Tchamba, 13 Feb. 1968, fl, *McKee 18393* (NOU); Vallee de la Nessepue, a 5 km de la mer, 20 Oct. 1970, fl, *Schmid 3447* (NOU); Poindimie: Ina, 10 Sep. 1976, fl, *McKee 31941* (NOU)2.

FIJI. Viti Levul I.: near Naivi-dula village, NE. part of island, 19 Oct. 1960, fl, *Hotta 3359* (KYO, TI)2; village of Nasau, NE. part of island, alt. ca. 250 m, 13 Oct. 1960, fl, *Hotta 3062* (KYO)2; Mba, Nandala Creek, alt. ca.780 m, 9-25 Sep. 1947, fl, *Smith 6253* (L)2; Tailevu, hills east of Waininbuka River, vicinity of Ndakuivuna, alt. 100–200 m, 15–27 Apr. 1953, fl, *Smith 7034* (L)2; Namosi, hills bordering Wainavindrau Creek, vicinity of Wainimakutu, alt. 150–250 m, 17 Sep.–8 Oct. 1953, fl, *Smith 8851* (L)2; Sleua, hills between Navua River and Wainiyaku Creek, alt. 100–200 m, 20 Oct. 1953, fl, Smith 8981 (L)2; Sleua, hills west of Waivunu Creek, between Ngaloa and Korovoa, alt. 50–150 m, 23 Nov.–7 Dec. 1953, fl, *Smith 9497* (L)3; Naitasiri Prov., vicinity of Nasinu, 9 mile from Suva, alt. 150 m, 20 Oct. 1927, *Gillespie 3401* (BO)2. —Vanua Levu I.: Thakaundrove, hills between Vatukawa and Watningio Rivers, Ndrekeniwai Valley, 24 Nov. 1933, *Smith 583* (BO)2. —Kandavu I.: Namalata isthmus region, alt. 0–30 m, 11–18 Oct. 1933, fl, *Smith 19* (BO)2. —Uounivanoua I.: Tailevu Distr., alt. 50 m, 21 Jul. 1955, yfr, *McKee 2819* (L)2.

TONGA. Vava'u I., north part of island, east of Mataki Niu'a, alt. ca. 140 m, 12 Aug. 1960, fl-bud, *Hotta 4957*(KYO)2 & *4965* (KYO)2; Mt Mo'ybgakafal; transect from SW corner of Lake 'Ano, Lat/Long: 18°39′37″S, 174°02′72″W, alt. 800 ft, 22 Oct. 1997, *Wood et al. 6942* (PTBG). —Eua Isl., west of Mt. Koloaki-lupe-tonga, east of Pngai Village, 10 Sep. 1960, fr, *Hotta 5480* (KYO)2.

SAMOA. Upolu I. Southern coast, Safata,Saanapu, on trail in mangrove forest, alt 0 m, 26 Oct. 2002, fr.s, *Kajita et al. 02102605* (TI)2/S; Satatoa mangrove forest, alt 0 m, 28 Oct. 2002, fr.s, *Kajita et al. 02102801* (TI)2/S.

***Entada tonkinensis*** Gagnep.

JAPAN. **Ryukyu Islands**. Yakushima I.: Yaku-cho, Anbo, 11 Aug. 1911, *Nakano s.n.* (MAK)2; *ibid.*, Sep. 1921, *Koidzumi s.n.* (KYO)2; *ibid.*, 3 Sep. 1926, *Masamune s.n.* (TI)2; *ibid.*, 11 Aug. 1954, *Takeuchi s.n.* (TI)2; *ibid.*, 10 Jul. 1968, *Hatusima 31557* (KAG)2; *ibid.*, Jun. 1971, fl, *Akahoshi s.n.* (KAG)2; *ibid.*, 4 Sep. 1984, fr.s, *Murata et al. 17162* (TI, TUS, URO)2/L; *ibid.*, 23 May 1983, *Moto s.n.* (TI)2; *ibid.*, 7 Jun. 1996, fl, *Kurima & Tateishi 131* (TI, URO)2; *ibid.*, 20 Jun. 1997, fl, *Kurima et al. 121* (TI, URO)2; *ibid.*, 22 Jun. 2001, *Wakita & Tateishi 210622* (URO)2/L. —Amami-Oshima I.: Sumiyo-son, Higashinakama, 7 Dec. 1900, *Uchiyama s.n.* (TI)3-4; *ibid.*, 13 Apr 1910, *Kamiya s.n.* (MAK)3; *ibid.*, 3 Jun. 1911, *Ueda s.n.* (MAK)3; *ibid.*, 16 Jul. 1919, *Kawagoe s.n.* (KAG); ibid., 6 Mar. 1924, *Tashiro s.n.,* (KYO, TAIF)2; *ibid.*, 15 Nov. 1927, *Saito 1567*, (TI)3; *ibid.*, Jun. 1982, fl, *Tabata s.n.* (KAG); *ibid.*, 2 Apr. 1988, *Iwano 19845* (TUS)3; *ibid.*, 14 Feb. 1990, fr, *Murata & Nemoto s.n.* (TUS)3; *ibid.*, 29 Oct. 1996, *Kurima et al. 120* (TI, URO)3/L; *ibid.*, 20 Jun. 1997, *Kurima & Matsumura 127* (URO)L; *ibid.*, 1 Aug. 1998, fr, *Tateishi & Yamashiro s.n.* (URO)3/L; *ibid.*, 30 Jun. 1999, *Yamazaki s.n.* (TI); *ibid.*, 21 Nov. 1999, fr, *Tateishi & Kurosawa 52005* (URO)3/L; *ibid.*, 24 Jun. 2001, fl & fr, *Wakita & Tateishi 210624-1* (URO)2-3/L & *210624-2* (URO)2-3/L; *ibid.*, 1 Jun. 2002, *Wakita 210601* (URO)3.

TAIWAN. Taipei Co.: Hsintien, alt. 100–200 m, 8 May 1985, fl, *Huang 2803* (TAI, TUS)2; Hsintien–Urai, 27 Mar. 1927, *Suzuki s.n.* (KAG)2; Taipei Forest Exp. Station, 24 Aug. 1914, *Kawagoe s.n.* (KAG)2. —Illan Co.: Tatung Village, Dulishan–Nioudou, alt. 300–400 m, 15 Sep. 1983, fr, *Ohashi & Nemoto 16849* (TAI, TUS, URO)2/L; Tahtung, 24°40′42.9″N, 121°35′97.7″E, 26 Sep. 2003, *Wakita 240926A* (URO)2/L, ibid., 24°40′32.4″N, 121°36′29.3″E, alt. 300 m, 26 Sep. 2003, *Wakita 240926B* (URO)2/L; Shuanglienpei~Juntou, alt. 100–500 m, 15 Oct. 1984, *Tateishi & Nemoto 20677* (KYO, TI, TUS)2-3; Juntou, 24°45′03.6″N, 121°39′92.3″E, alt. 250–300 m, 25 Sep. 2003, *Wakita 240925A & 240925B* (URO)2; Xiaonan'ao, *Unknown collector, s.n.* (MAK)2. —Nantou Co.: Yuchih-hsiang, Lienhuachih, 120°53′E, 23°55′N, in 1926, *Araki s.n.* (TUS)3; Puri, 2 Nov. 1929, *Saito 7810* (L, TI)2.

CHINA. **Fujian**. Longxi Diqu, Xinxu Gongshe, Maping, alt. 400 m, 4 Jun. 1959, *Huang 190443* (IBSC)2. **Hong Kong**. Tai Po Kau Nature Reserve, Man Ping, Hoi Ha, 22°25′33″N, 114°10′55″E, alt. 170 m, 4 May 2005, fl, *Ohi-Toma 20050504* (TI)2. **Guangdong**. North River, Man Sze Hop, 11 Apr. 1914, fl, *Tutcher 10781* (IBSC); Luofo Shan, in valley, 6 May 1978, fl, *K'tung 6063* (IBSC, L)2. —Yunfu Shi: Zhucun, 15 May 1934, fl, *Wang 36902* (IBSC)2; Dayonghe, 20 May 1934, fl, *Wang 36901* (IBSC)2; Huangdongkeng, 13 Feb. 1929, fr.s, *Huang 1841* (IBSC)L. —Zhaoqing Shi: Dinghu, Dongkeng, 28 Jun. 1976, *Shi 12324* (IBSC)2; Dinghu, Jiukeng–Taikeng, alt. 400 m, 23 Jun. 1964, fr.s, *Ting & Shi 10251* (IBSC)2/L; Dinghu, Qingyunsi, Houshan, 13 Jul. 1979, fl, *Shi 13831* (IBSC)2/L. —Huizhou Shi, Boluo Xian, Mt. Luofu, Baishuimen, 27 May 1930, fr, *Chun 41127* (IBSC)2;

Boluo Xian, Mt. Luofu, Sulaoguan, 26 Feb. 1930, fr.s, *Gao 50107* (IBSC) 2/L; Boluo Xian, Mt. Luofu, Niujiaokeng, 6 May 1978, fl, *Staff of IBSC 6063* (IBSC)2. —Jiangmen Shi, Taishan Xian, Dalongdong, Niuyuanshan, 31 Aug. 1930, fr, *Tso 22363* (IBSC)2. **Guangxi**. in 1958, fr.s, *Chang 619*, (IBSC)2. —Liuzhou Diqu, Luoxiu Gongshe, Luoxiang Shan, alt. 300 m, 4 Apr. 1982, fl, *Dayaoshan Exped. Team 13883* (IBSC)2. —Baise Diqu, Lingyun Xian, Lingzhan, Baiji Cun, Langguangou, alt. 450 m, 15 Sep. 1989, fr, *South China Exped. Team 1609* (IBSC)2; Xiancheng–Yuhong, alt. 1300 m, 7 Dec. 1957, fl, *Chang 11106* (IBSC)2; Napo Xian, Poman, alt. 850 m, 17 Oct. 1997, *Akiyama et al. 1244* (TI, URO)2; Napo Xian, Nonghua Reserve, alt. 900 m, 10 May 1989, fl, *South China Exped. Team 505* (IBSC)2. —Quinzhou Diqu, Shangsi Xian, Nangui, Muxi, 9 Nov. 1958, *Chang 13107* (IBSC); S.E. of Shangsi, near Iu Shan village, Mts. Shiwan Dashan, 7 May 1933, fl, *Tsang 22232* (IBSC, P)2; Naliang–Damian, 15 Apr. 1956, fl, *Academia Sinica Guangdong Bot. Exped. 2368* (IBSC)2; Mts. Shiwan Dashan, Fuqin Xiang, alt. 400 m, 23 Mar. 1944, fl, *Chun 4765* (IBSC)2; Shiwan Dashanqu, Dong'an Xiang, Zhumu He, alt. 200 m, 8 Jan. 1944, fr, *Chun 4325* (IBSC)2/L; Guitai, Wugushan , alt. 380 m, 12 Apr. 1959, fl, *Gan 40035* (IBSC)2. —Nanning Diqu, She-feng Dar Shan, alt. 2000 ft, 28 Oct. 1928, fr, *Chang 8279* (IBSC)2, Longjin, Daqing Shanq, Nadian, alt. 450 m, 25 Dec. 1957, fr, *Tam 57616* (IBSC)2; near Daming Shan, alt. 300–350 m, 10 May 1957, fl, *Chun 12428* (IBSC)2; Longzhou Xian, Daqing Shan, 1 Jun. 1935, *Gao 55206* (IBSC)2. Lo-hsiang, 1 Dec. 1928, *Sin 3800* (IBSC)2, 18 May 1929, fl, *Sin 8277* (IBSC)2. **Yunnan**. No precise locality, in 1940, *Chang 1475* (IBSC)2. —Honghe: Dawei Shan, below Jinzhu, Dashutang, alt. 2300 ft, 4 Apr. 1940, fl, *Wang et al. 100381* (IBSC)2; Dawei Shan, Laozhai, alt. 2600 ft, 25 Feb. 1940, fr, *Wang et al. 100161* (IBSC)2/L; Hekou, 27 Apr. 1940, fl, *Chang 1544* (IBSC)2.

VIETNAM. No precise locality, 23 May 1962, fr, *Phanchung 1563* (HNU)L. —Vinh Phu Prov.: Near Tu Vu, Valley of Banton, in 1888, *Balansa 2130* (P, holotype and isotype of *E. tonkinensis*)2; Mt. Tam Dao, 1 Aug. 1917, fr, *Hayata s.n.* (TI); *ibid.*, on the way to Dihn Rung Rinh Peak, alt. 950–1000 m, 10 Dec. 1996, fr.s, *Tateishi 44188* (URO)2/L; *ibid.*, 16 Aug. 1997, *Tateishi 1283* (URO)2/L. Ha Son Binh (Soy Tay) Prov.: Mt. Bavi, alt. 700 m, 24 May 1940, fl, *Petelot 2468* (HNU)2; Bavi, Dinh Ngoc Hoa Peak, 11 Aug.1997, *Tateishi 1228* (URO)2/L. —Ha Nam Ninh Prov.: Cuc Phuang, 13 Jan. 1983, *Russian & Vietnamese Research Group 1258* (HN), Cuc Phuang National Park, 20°21′00″N, 105°35′37″E, alt. 365 m, *Murata et al. 20041218-39* (TI)2/L.